Editorial

Medical aid in earthquake disasters

WANG Zheng-guo 王正国 and SONG Shuang-ming 宋双明*

General condition

Population growth, urbanization process speeding up, fast industry development, especially irrational exploitation of the land, water resources, and forest, get our living environment worse and worse. A sound ecological system of the globe becomes unbalance. As a result, natural disasters have the tendency to increase.

According to the statistics of the International Red Cross, the worldwide devastating natural disasters of 1970s were 1.25 folds rise of 1960s, and 1.5 folds in 1980s over 1960s. The total number of casualties elicited by disasters was 5 folds in 1970s higher than 1960s.[1] Most of the natural disasters (90%) take place in developing countries or underdeveloped countries.[2]

Earthquake is the consequence of movement, crushes and collisions between the crustal plates. It is one of the most serious natural catastrophes in the world. From the beginning to 1990s, earthquake had claimed 2.6 million lives and it accounted for 58% of the total death toll caused by various disasters, in which the number of the injured was 3 folds of the died.[1,3] The worldwide death toll caused by earthquake is approximately 8 000-15 000 people each year.[4,5]

Our country is a multiple earthquake-stricken country and the fatality is also high. Since there were recorded data on earthquake, 17 huge earthquakes have striken in the world in which over 50 thousands people died in each of the earthquakes, of which 7 took place in China (except the Wenchuan earthquake). From 1966 to 1976, people died from earthquake in China accounted for 63% of the total death toll claimed by earthquake at the same time in the world.[5]

In October 4, 1993, *America Today* announced top 10 earthquakes in the world since the data available on earthquake after 526 AD, of which 5 took place in China (Table 1).[6]

Table 1. Death toll in 10 huge earthquakes in the world

Date	Place	Death toll
January 24, 1556	Shannxi, China	830 000
October 11, 1737	Calcutta, India	300 000
May 20, 526	Antioch, Syria	250 000
July 28, 1976	Tangshan, China	242 000
September 1, 1923	Yokohama, Japan	200 000
May 22, 1927	Gulang, Gansu, China	200 000
December 30, 1730	Hokkaido, Japan	137 000
December 16, 1920	Gansu, China	100 000
September 27, 1290	Ningcheng, Inner Mongolia,China	100 000
December 28, 1908	Messina, Italy	83 000

Characteristics of earthquake occurrence

Sudden strike Since mankind have not been able to grasp the regularity of earthquake occurrence so far, it is difficult to make an accurate forecast. It is said by earthquake specialists that experts currently have the ability to explore the dynamic alterations of the crustal superficial structure of 10 km in depth, unfortunately however, the structural alterations in the crust are mostly as deep as 15-20 km or even deeper when earthquake takes place. Therefore, it is impossible to detect.

Mass casualties Over 7.0-magnitude intensive earthquakes will lead to tremendous building collapse and a large number of people buried. If an earthquake occurs in an area where people are densely inhabited and there are numerous high buildings, the casualties would be more horrible, in which ten thousands or even hundred thou-

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*Corresponding author: Academician of Chinese Academy of Engineering, Tel: 86-23-68808235, E-mail: wangzhg@cae.cn

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sands of lives would be losing within a couple of minutes, such as the Tangshan and Wenchuan earthquakes.

Severe injuries Most of the injuries are bruise and crush injuries. Mechanical injuries including direct smash, crush, and buried wounds account for approximately 95%-98% of injuries,[1] of which over 70% of wounds are bone fractures, 20% head and chest injuries, 1.6% abdominal injuries. Among various fractures, extremities account for 40.87% (over 90% belong to closed fractures), spinal column for 25.1% (30%-40% are complicated by paraplegia, in which 2/3 belong to pamplegia), pelvis for 22.29%, and ribs, 10.13%.

Difficulty in emergency care It is generally very difficult to get into quake-hit areas for medical rescue at the early time because of road destruction and communication interruption. The survival rate of victims rescued at the first 24 hours is about 90%, 50%-60% for the second 24 hours, and 20%-30% for the third 24 hours. Thereafter the survival chance becomes less and less, but there is a report that victims are successfully rescued after being buried for 13 days.[7]

Medical aid

Medical aid can be classified into three stages: search for the wounded, emergency treatment and specific treatment.[8]

Search for the wounded It is mainly accomplished by fire fighters, armed forces, militiamen. Using the life detector, metal cutters, crane or just barehanded, rescue workers claw buried victims out of the rubble. At that condition, victims should keep calm, steady, and firm, conserve physical strength, strive for connection with outside or wait patiently for relief. It is preferable to conduct appropriate self-aid if there is certain space to move.

Emergency treatment It is essential to ensure respiratory unobstructed. Immediate resuscitation is mandatory for cardiac and respiratory arrest victims, hemostasis for bleeding patients, and wound bandage. Thoracentesis is necessary for those with open chest wounds. External fixation should be performed as early as possible for fractured patients. After above-mentioned treatments, victims should be transported to safe areas. During the transportation, meticulous care should be taken to cervical vertebra- and thoracolumber vertebra-injured patients, the former should be placed on a plank stretcher and keep the head at a fixed traction position; the latter is given the same transportation method and great care should be taken to prevent fracture dislocation.

Prevention and treatment of infections especially anaerobic infection are important. 1500-3000 IU tetanus antitoxic serum should be injected intramuscularly to prevent tetanus. Treatment options also include metronidazole, imipenem, penicillin G administration, high pressure oxygen therapy or wound washout with hydrogen peroxide. For patients with gas gangrene infection manifested by extreme swelling and necrosis of local tissues, putrefactive odor, and subcutaneous crepitation, isolation measures are a must and amputation has to be considered for severe cases.

Specific treatment For severely-injured patients, transfusion passage should be established as soon as possible, urethral catheterization is conducted if necessary. The principle, i.e. to rescue the critical wounded preferentially and save life first, should be rigidly followed. Surgical interventions are only limited to simple life-saving operations.[9] Specific operation or further management should not be performed till patients' condition is stable or evacuated to well-equipped medical units. Active antishock regimens should be undertaken, and a large quantity of saline, glucose, insulin, and diuretic should be given to those with crush injury or crush syndromes. Dialysis is necessary if patients present with the signs of oliguria, anuria, or hyperkaliemia. Sodium bicarbonate is administered to facilitate myohemoglobin dissolving.[10] Intermuscular septum should be thoroughly cut off to abate interfascial tension for those with obvious swelling of the limbs associated with circulatory disturbance. Ketamine is preferred for anesthesia.[11]

Sanitary and antiepidemic Overall sanitary and epidemic prevention and sterilization should be undertaken about one week after earthquake (or even earlier if enviromental temperature is high). Measures should be taken to ensure the safety of drinking water and food. The corpses have to be buried or burned and sewerages should be disposed of so as to clean up the sanitary environment of the disaster areas.

A few points of thoughts

The earthquake relief work of the 5.12 Wenchuan megaseism has fully displayed the love of our party and nation leadership to the people of disaster zones. It is highly admired and applauded by people around the world for their fast response and the action. They rushed many times to afflicted areas during this period. The powerful command and coordination of the government make the whole rescue effort efficient and orderly. The military and armed police are always in the vanguard of the combat. Numerous numbers of heart-touching deeds have emerged. The compassion and enthusiasm of our people as well as Chinese people living abroad on money- and goods-donation campaign are unprecedented. The Wenchuan earthquake has enhanced the cohesive force of our nation. We firmly believed that the rescue effort will surely achieve final victory.

Forecast As mentioned above, to forecast precisely an earthquake is beyond the mankind capacity, but there are certain earthquakes that are successfully predicted, such as the Haicheng earthquake (7.3 magnitude) in Liaoning Province of China in 1975. It is due to the precise prediction that the casualties are substantially diminished with only 1 328 deaths and 4 292 injuries. Studies on earthquake prediction should be emphasized and great efforts should be made on it in the future.

Organization and command It is almost unavoidable that there is short time chaos following earthquakes. A command unit and medical rescue organization should be quickly set up organized by the government after earthquake. They are responsible for exploring the extent of an earthquake-hit disaster, dispatching medical team to quake-hit areas. In this way, it can potentially avoid unduly concentrating medical staff in certain areas. Only life-saving operations are performed in quake-hit areas. Most specific operations should be performed in evacuated medical units. It is inappropriate to assign all the first-level medical workers to quake-hit areas. Only a few of them are needed responsible for instruction and most of the rescue workers sent to the quake-hit areas should be young or middle-aged who are physically fit and have good professional skills. At the same time, a self-sustaining medical unit equipped with basic settings and facilities, including temporary wards, operating room, and equipment for communication, transportation, board and lodging, etc. are also fundamental.

Training at ordinary time In order to cope with emergent accidents, major hospitals in normal time should formulate schemes to meet an urgent need, lay up needed goods and materials, set up staffing training courses on rescue knowledge and skills and try to let them become experts in one thing and good at many.

Propaganda of general knowledge on earthquake Using the modalities of video film, booklet, imitating practice and so on, the departments concerned should let the people understand earthquake-related knowledge, grasp self-protection methods.

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